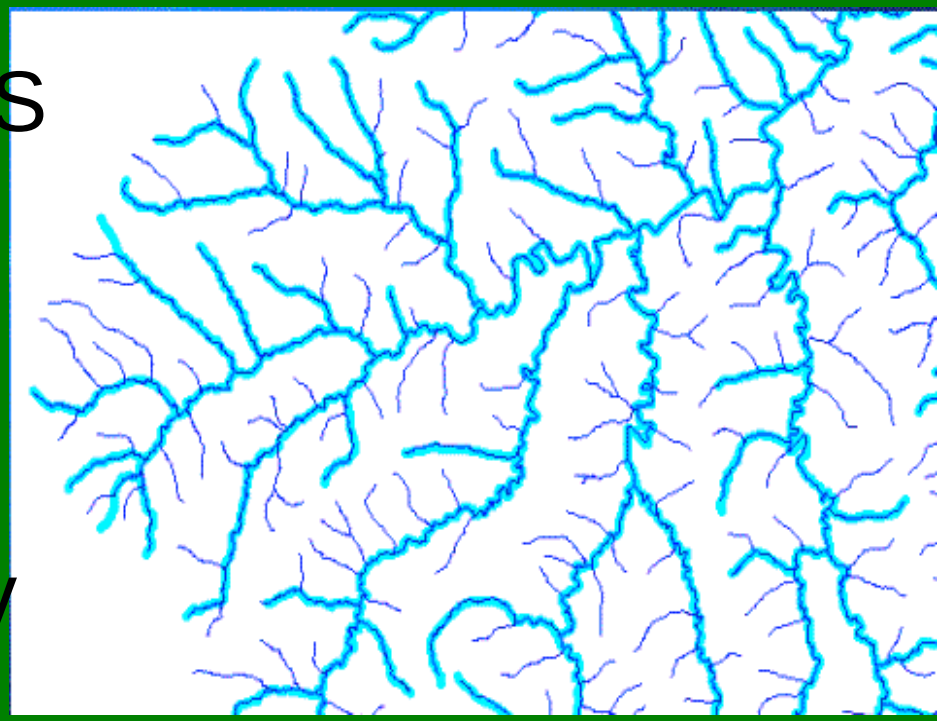
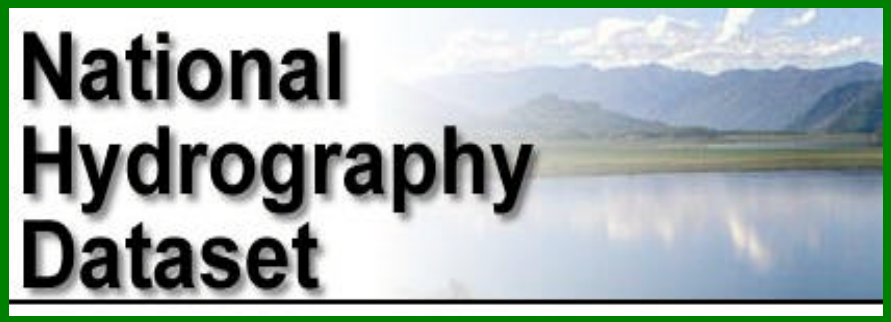
National Hydrography Dataset (NHD)

Charley Hickman USGS
chickman@usgs.gov

Steve Miller, MDEQ
millers6@michigan.gov





National Hydrography Dataset

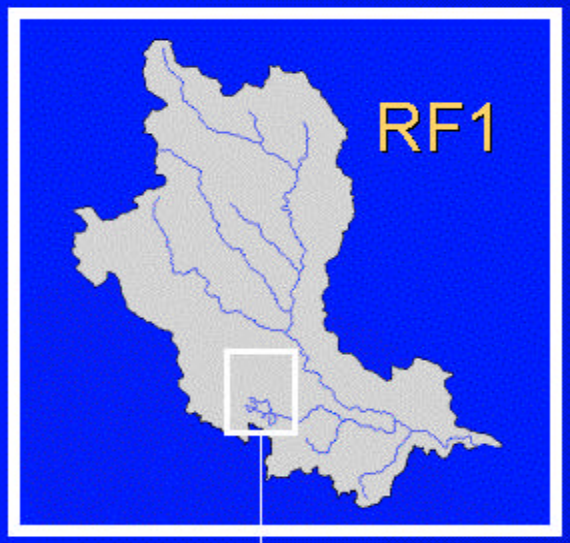
A comprehensive set of digital spatial data that contains information about:

- **naturally occurring and constructed bodies of water**
- **natural and artificial paths through which water flows**
- **related hydrographic entities.**

Seamless Data

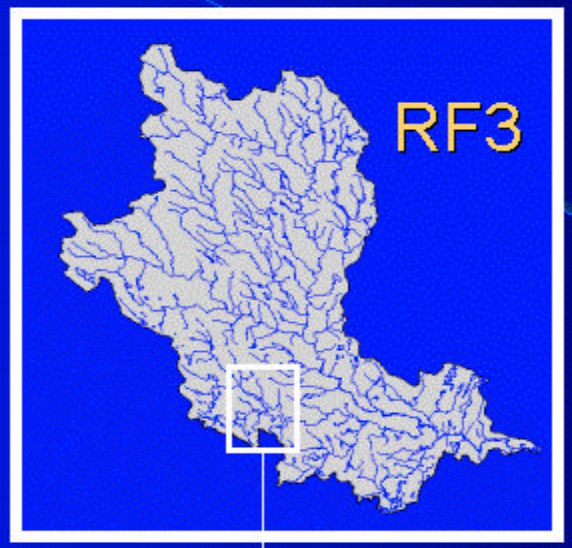
- Not quad based
- Online access
- GIS ready
- Transactions
- Versions
- Variable-resolution
- Update features as needed
- Feature-level metadata

Reach File History



1982

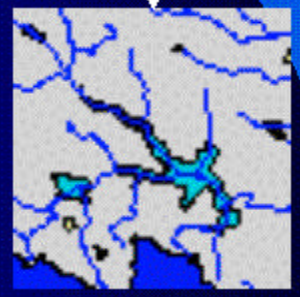
1:500,000
Centerlines & Shorelines
No Waterbodies
68,000 reaches



1992

1:100,000
Shorelines
No Waterbodies
3,000,000+ reaches

1999



1:100,000
Centerlines & Waterbodies
52 Carto Feature Types
3,000,000+ reaches

Reach Files – RF1, RF2, RF3, NHD

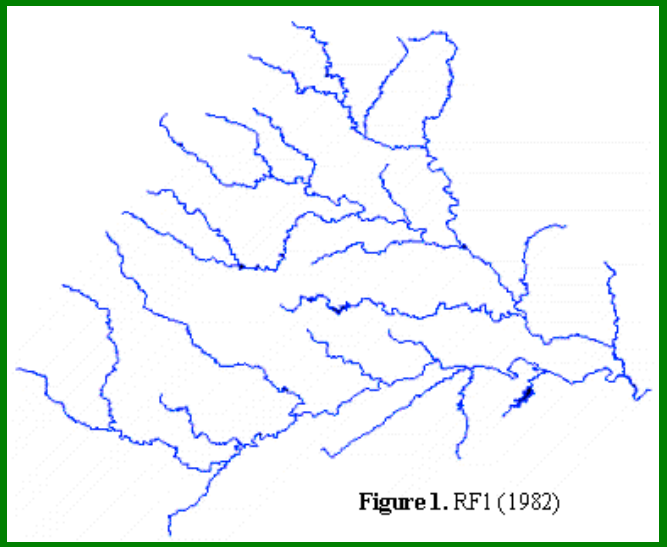


Figure 1. RF1 (1982)

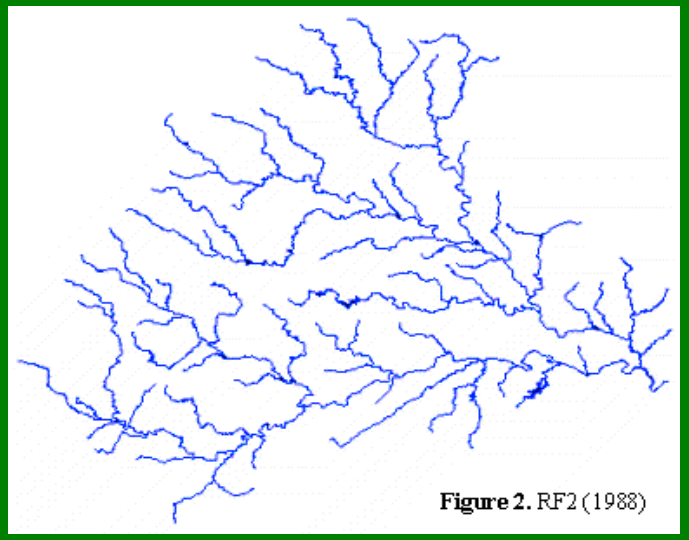
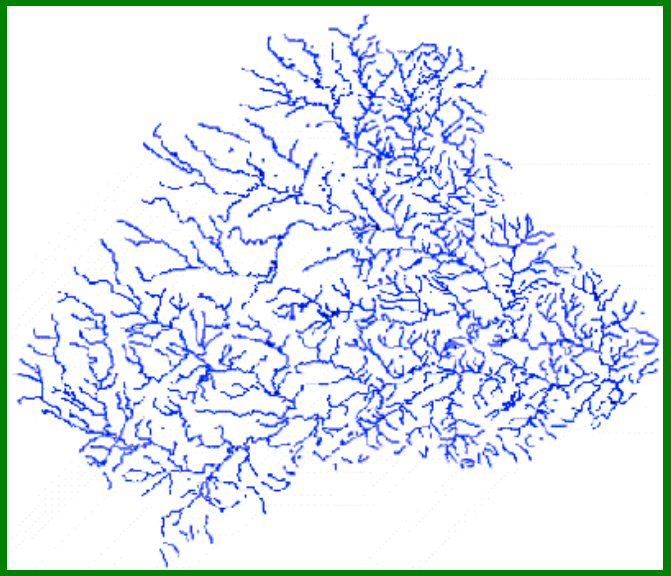
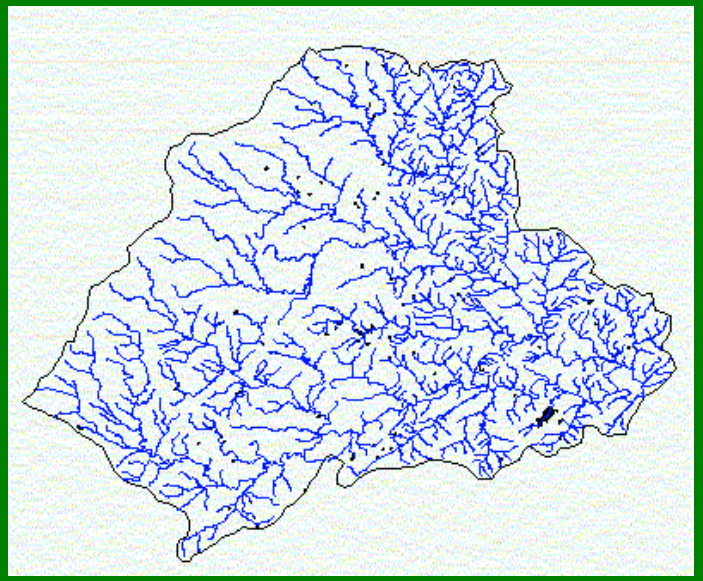
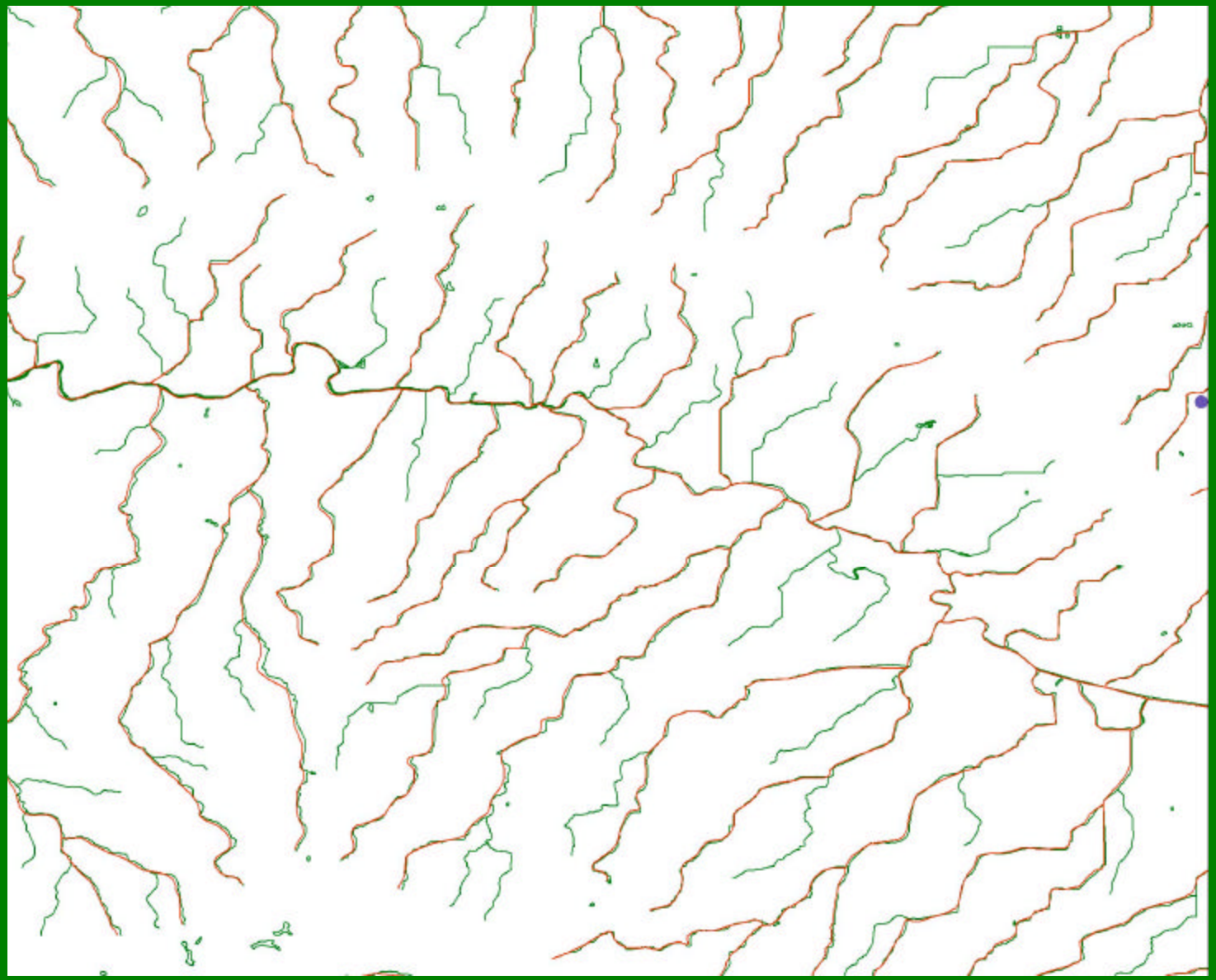


Figure 2. RF2 (1988)

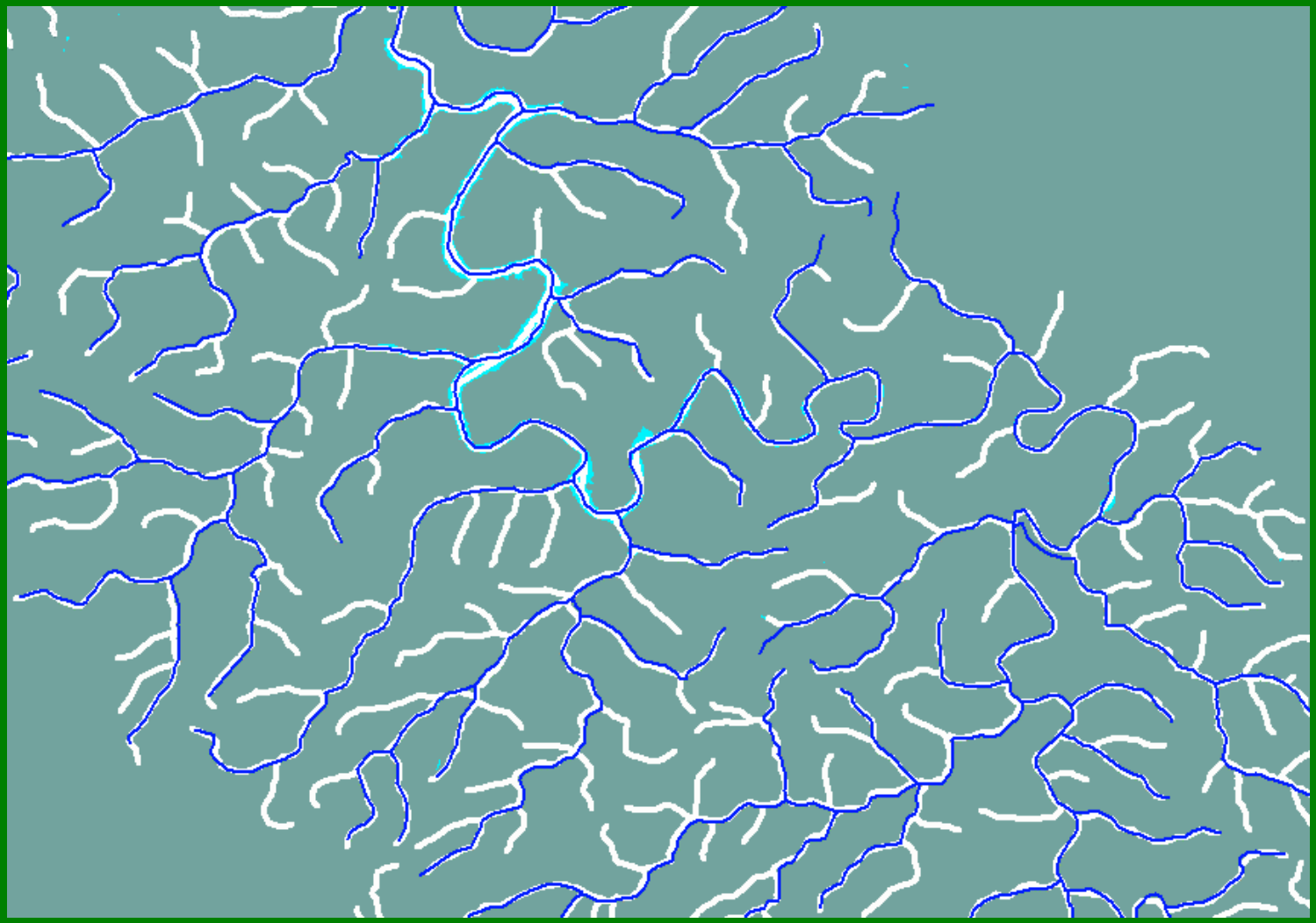




100K NHD and 24K NHD

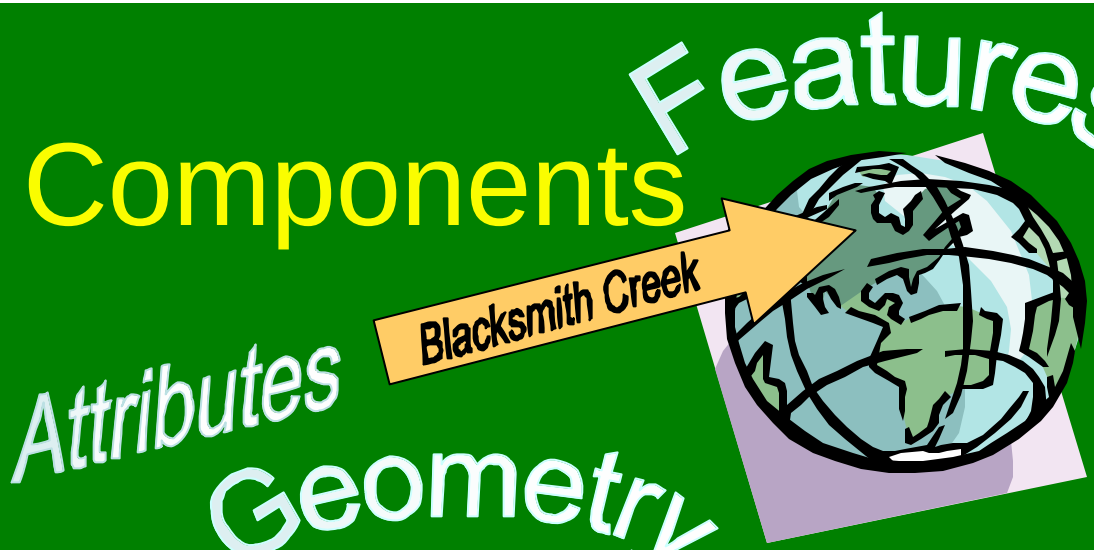


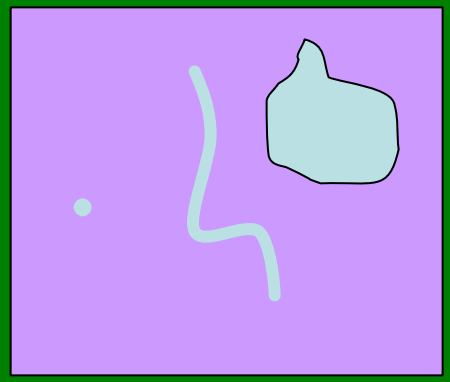
100K NHD and 24K NHD

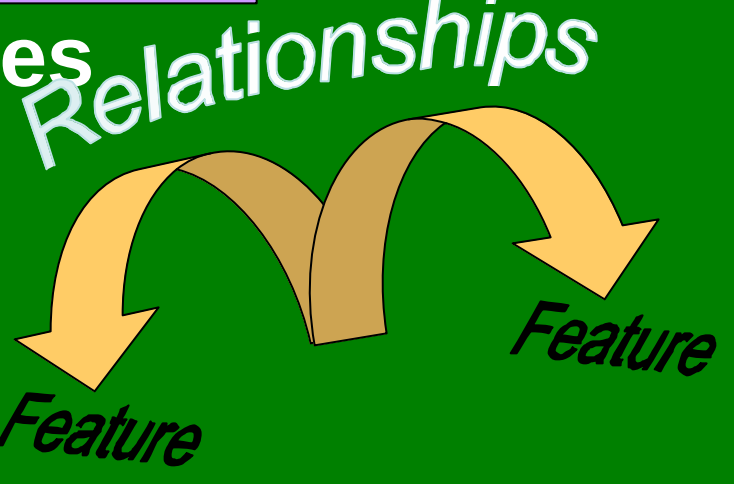


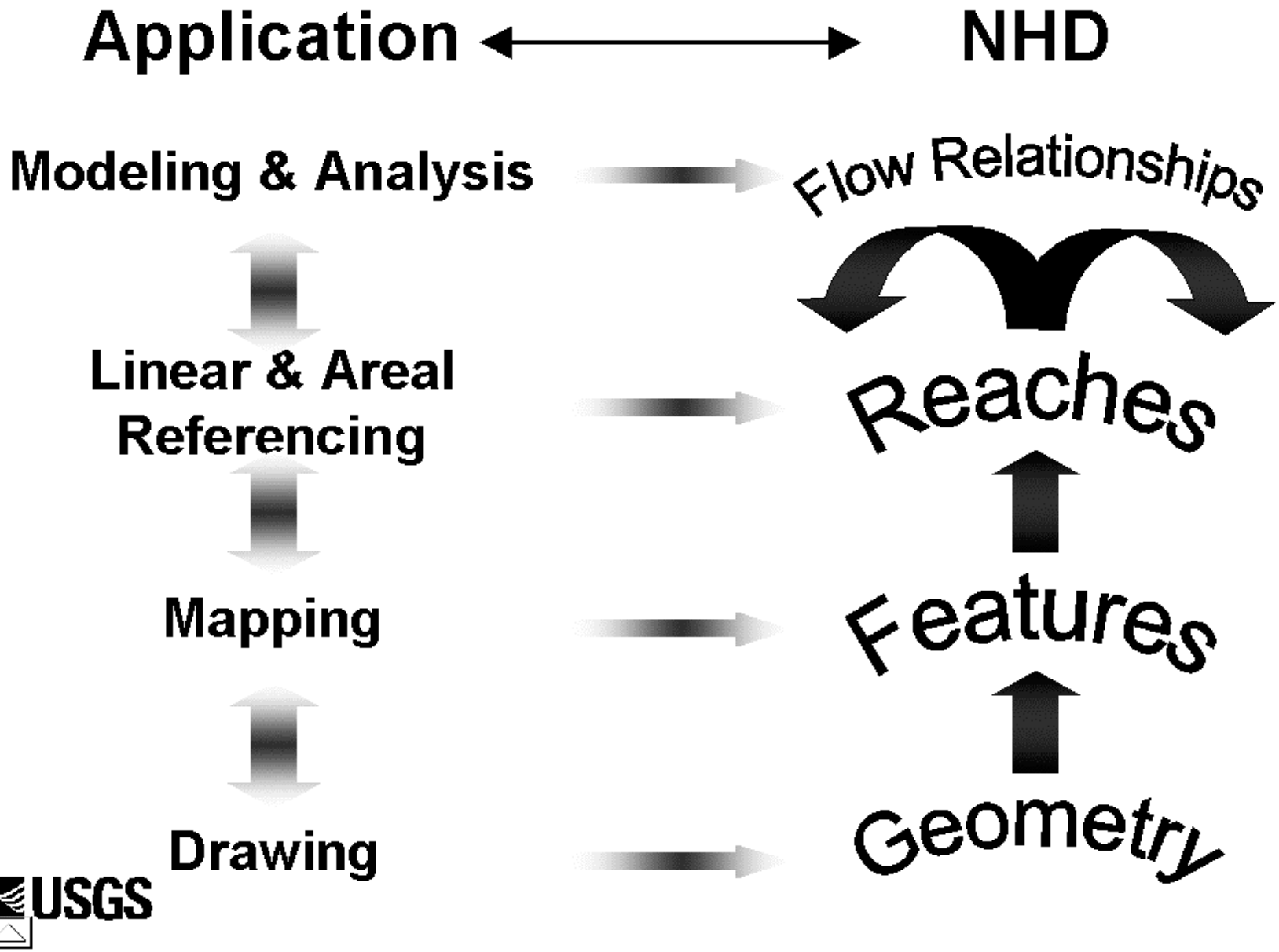
Main Components

- **Features**
- **Reaches**
- **Flow relationships**
- **Geographic names**
- **Level paths**
- **Coordinates and measures**
- **Metadata**







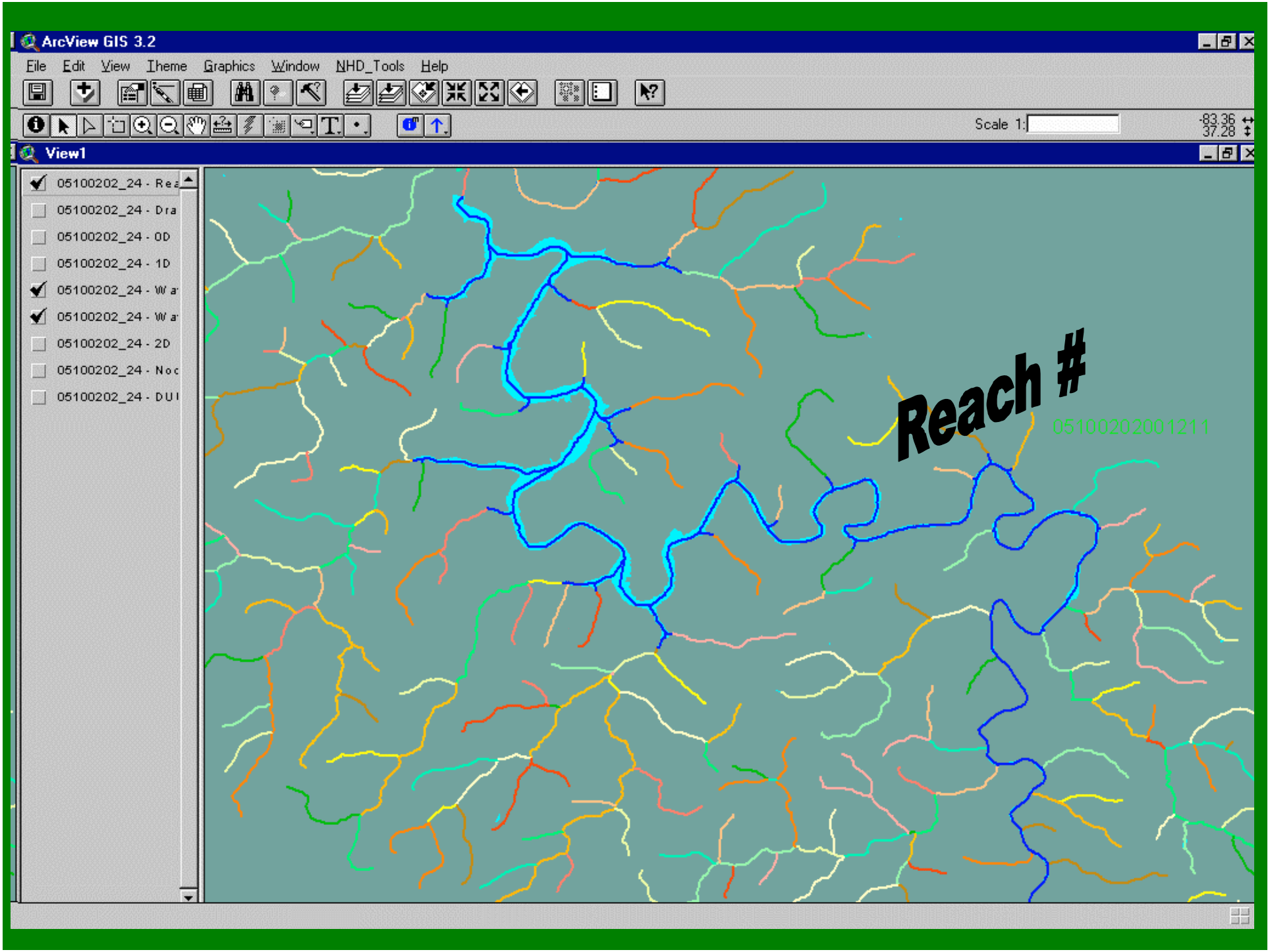

Application
NHD
Modeling & Analysis
Flow Relationships
Linear & Areal Referencing
Reaches
Mapping
Features
Drawing
Geometry
USGS

Features

- Represent bodies of water, paths through which water flows, and related hydrographic entities
- Contain the information found on USGS topographic maps:
  - Stream network – streams, canals, other paths: 80%
  - Water bodies – lakes, reservoirs, other areas: 14%
  - Landmarks – dams, bridges, geysers, other items: 6%
- Classified by feature type using:
  - A five-digit feature code
  - Text aliases for the feature code in a lookup table

Reaches

- **Segments of surface water with similar hydrologic characteristics**
- **Unique reach code identifies each reach**
  - **Cataloging unit number + sequential number**
- **Three types of reaches implemented**
  - **Transport (lines oriented in direction of flow)**
  - **Coastline (lines oriented so water is on right)**
  - **Waterbody**


ArcView GIS 3.2
File Edit View Theme Graphics Window NHD_Tools Help
Scale 1:
View1
05100202_24 - Rea
05100202_24 - Dra
05100202_24 - 0D
05100202_24 - 1D
05100202_24 - Wa
05100202_24 - Wa
05100202_24 - 2D
05100202_24 - Noc
05100202_24 - DUI
Reach #
05100202001211

Reaches in RF3 and NHD

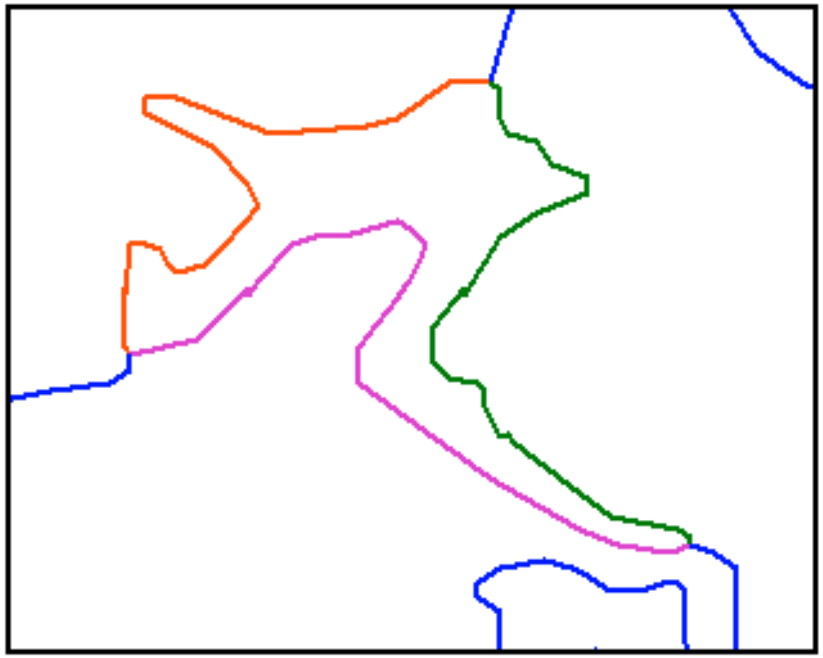


Figure 1: Lake representation in RF3; the lake actually consist of 3 reaches (red, green, purpul).

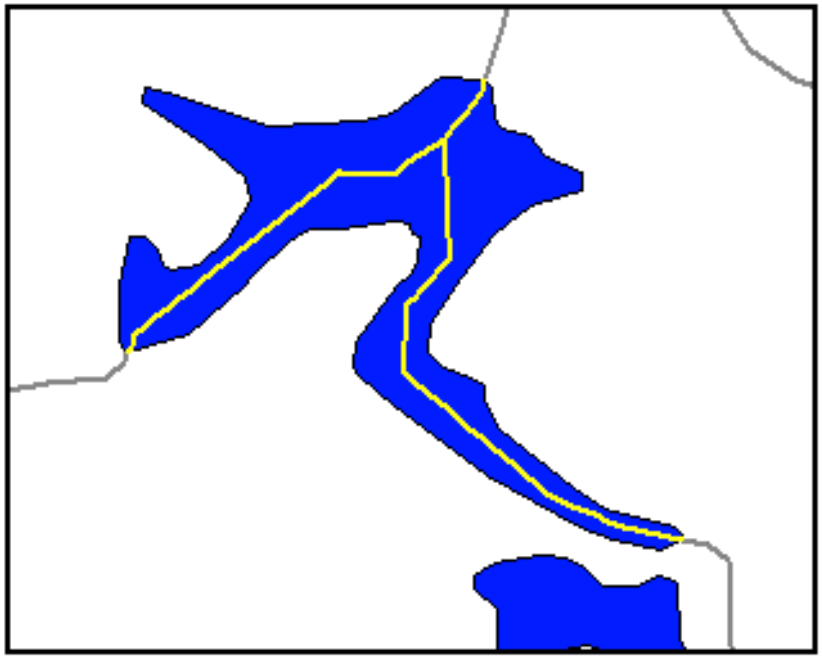


Figure 2: Lake representation in NHD; the lake consists of a polygon and a single reach (artificial path)

From Spoerri, Miller, and Dabolt, 2000

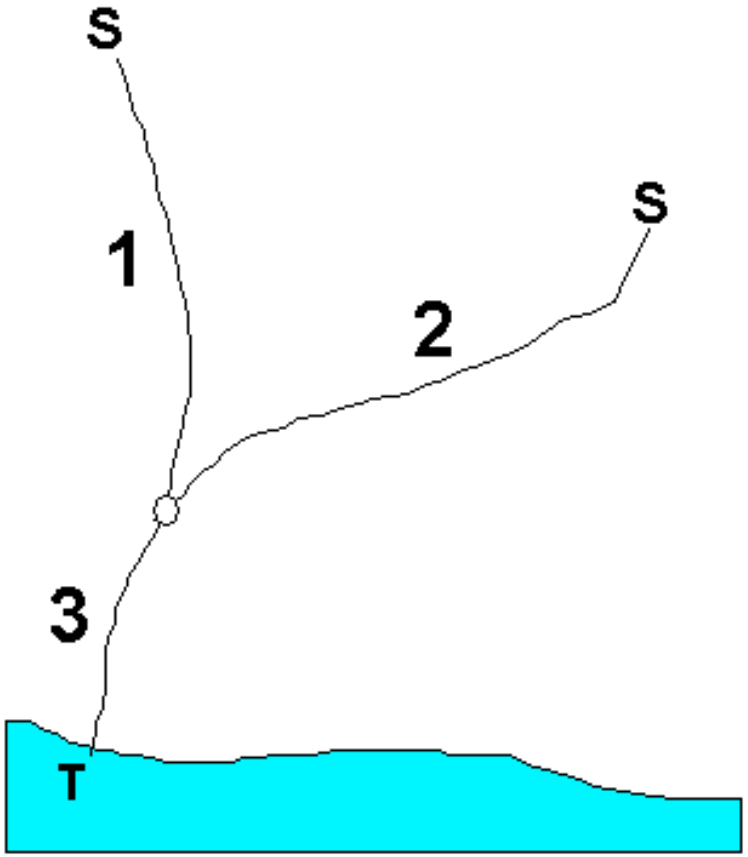
Geographic Names

- **The proper name, specific term, or expression by which a particular geographic entity is known**
- **An identifier maintains a link to the Geographic Names Information System**
- **Reaches carry the geographic name most often; features only carry the name if they are not part of a reach.**

Relationship Between Reaches

- **Flow relationships link individual transport and coastline reaches to form the surface water drainage network**
- **Flow relationships describe**
  - **The network connectivity between reaches**
  - **The direction of water flow between transport reaches**
  - **The traversal of the coastline along coastline reaches**
  - **The order of termini of individual drainage networks along the coastline**

Relationships between reaches



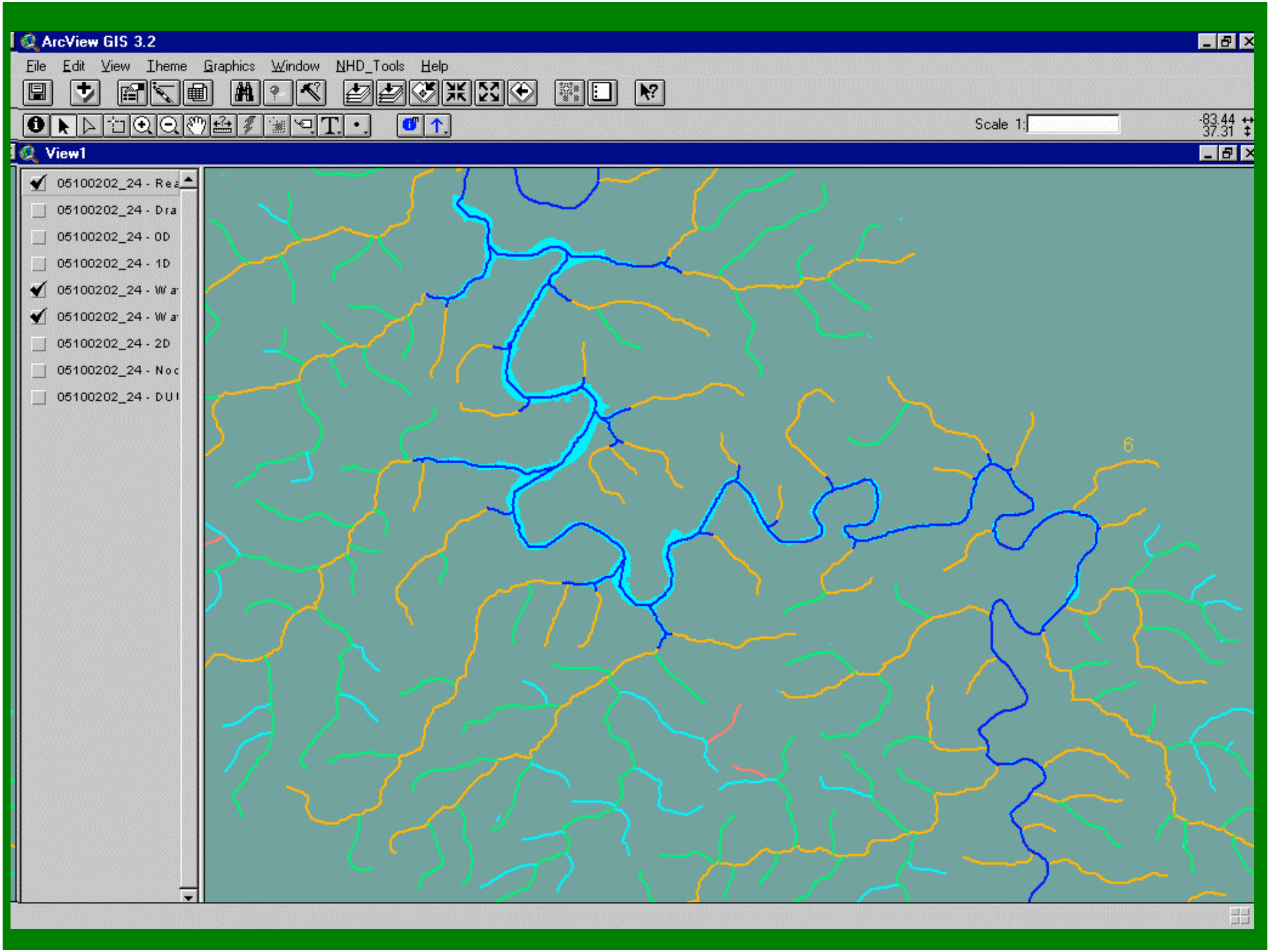
Flow Table

Rch1	Rch2	Seq	Direction
1	3	0	In
2	3	0	In
-	1	0	Start
-	2	0	Start
3	-	0	Terminal

USGS

Level Paths

- The ordered set of transport reaches that trace the main path for a given flow of water
- Identifies the main path to which a particular transport reach belongs
- Still working on implementation


ArcView GIS 3.2
File Edit View Theme Graphics Window NHD_Tools Help
Scale 1:
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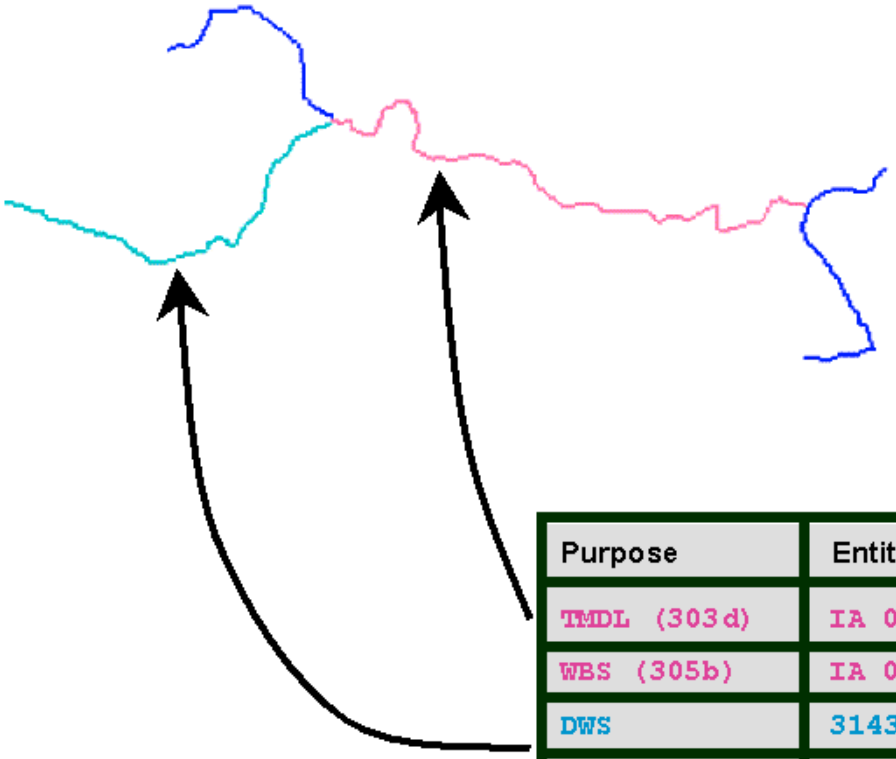
37.31
View1
05100202_24 - Rea
05100202_24 - Dra
05100202_24 - 0D
05100202_24 - 1D
05100202_24 - Wa
05100202_24 - Wa
05100202_24 - 2D
05100202_24 - Noc
05100202_24 - DUI
6

Metadata

- Metadata, or data about data, describes the content, quality, condition or other characteristics of data
- Uses the FGDC metadata standard
- In the initial release of the data, there is metadata for
  - The entire NHD
  - Collections of features or reaches, normally organized by
    - quadrangle digital update units for features
    - cataloging unit digital update units for reaches

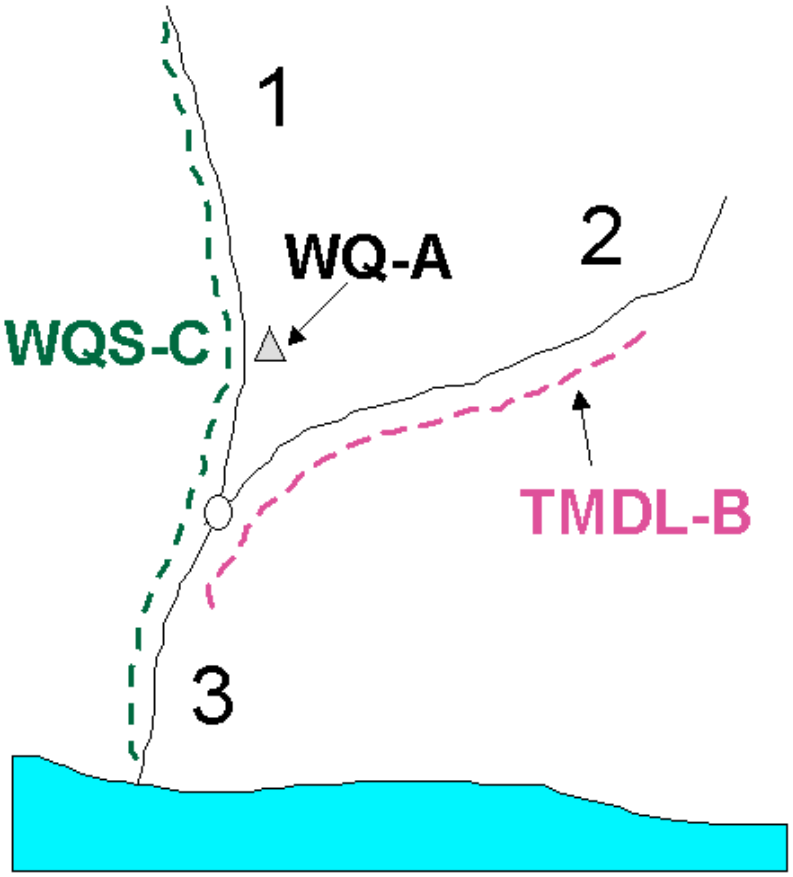
Linear referencing



Purpose	Entity ID	Reach Code
TMDL (303d)	IA 02-WFC-0120_07080204_1	07080204000080
WBS (305b)	IA 02-WFC-0120_449 0	07080204000080
DWS	3143	07080204000082
DWS	3142	07080204000082
Flow Gages	USGS054600 00	07080204000082
PCS	IA0058441	07080204000082

USGS

Linear referencing



Description	Program System ID	Reach ID	Begin Position	End Position
WQ Monitoring	WQ-A	1	30	-
303(d) Listed	TMDL-B	3	65	100
		2	0	80
Water Quality Standard	WQS-C	3	0	100
		1	0	100

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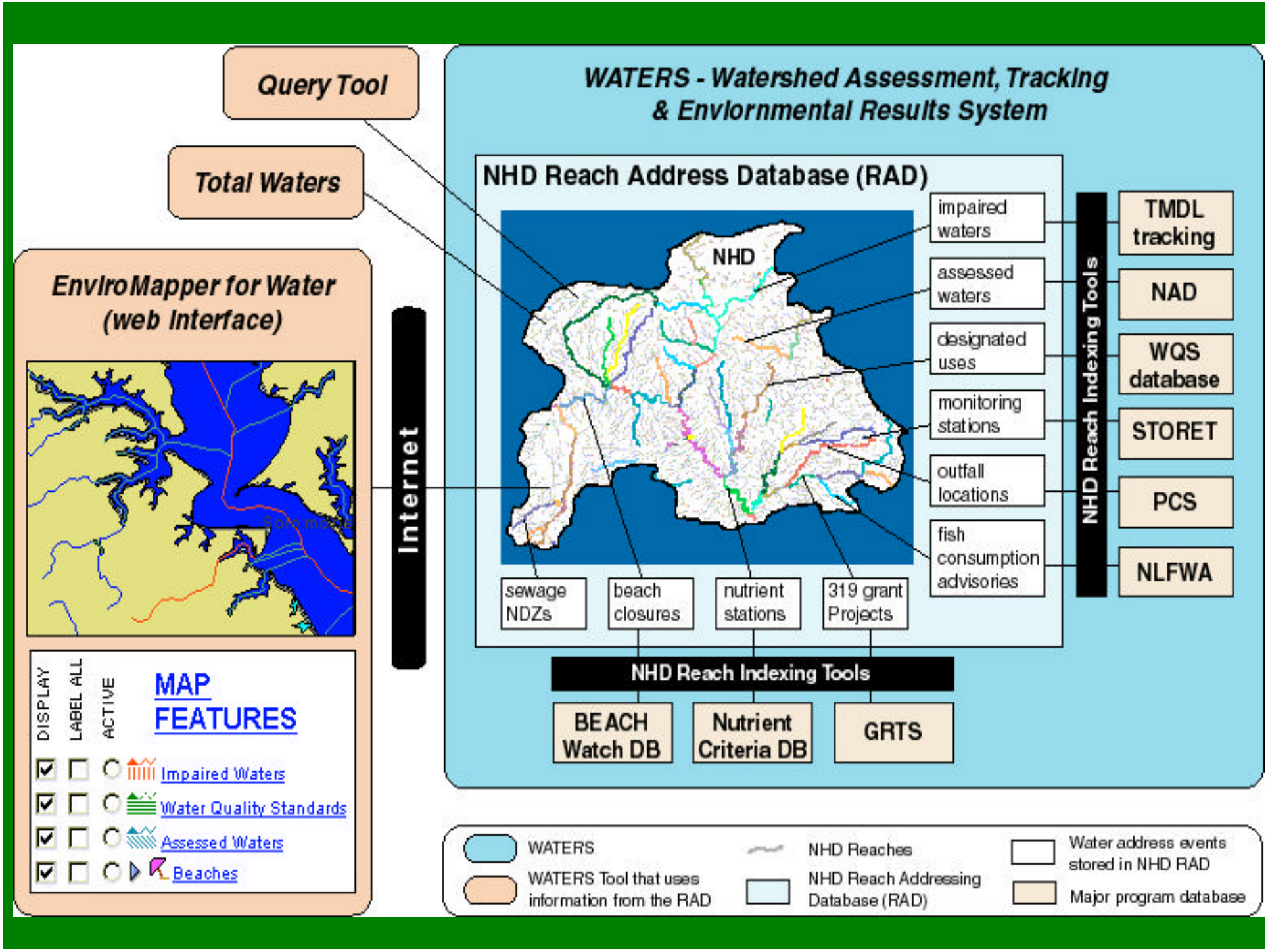
NHD – Applications and Related Programs

How is NHD used?

- **Support inventory, analysis, visualization, mapping, modeling . . .**
- **Water quality, flooding, fish . . .**


Query Tool
Total Waters
WATERS - Watershed Assessment, Tracking & Environmental Results System
NHD Reach Address Database (RAD)
NHD
impaired waters
assessed waters
designated uses
monitoring stations
outfall locations
fish consumption advisories
NHD Reach Indexing Tools
TMDL tracking
NAD
WQS database
STORET
PCS
NLFWA
sewage NDZs
beach closures
nutrient stations
319 grant Projects
NHD Reach Indexing Tools
BEACH Watch DB
Nutrient Criteria DB
GRTS
Internet
EnviroMapper for Water (web Interface)
DISPLAY
LABEL ALL
ACTIVE
MAP FEATURES
Impaired Waters
Water Quality Standards
Assessed Waters
Beaches
WATERS
WATERS Tool that uses information from the RAD
NHD Reaches
NHD Reach Addressing Database (RAD)
Water address events stored in NHD RAD
Major program database

NHD – Applications, Related Programs, and Tools (1)

- RIT - Reach Indexing Tool for NHD - georeferencing surface water databases to NHD
- BASINS - Better Assessment Science Integrating Point and Nonpoint Sources - integrated watershed environmental modeling
- CWAEM - Clean Water Act Effects Model - basic water quality modeling and economic analysis
- NAWQA - National Water-Quality Assessment Program
- NLFWA - National Listing of Fish and Wildlife Advisories

NHD – Applications, Related Programs, and Tools (2)

- WATERS - EPA Water Assessment, Tracking & Environmental Results
- Section 303d, Clean Water Act
- TMDL - Total Maximum Daily Load
- Section 305b, water quality assessment
- STORET - data STOrage and RETrieval system - water quality data repository

NHD – Applications, Related Programs, and Tools (3)

- **NRS - EPA National Recreation Survey**
- **NWIS - National Water Information System**
- **NWPCAM - National Water Pollution Control Assessment Model - modeling economic benefits related to water quality**
- **RIMDESS - River Management Decision Support System - modeling point and nonpoint discharges, nutrient routing and decay, and nitrogen loading in rivers and estuaries**

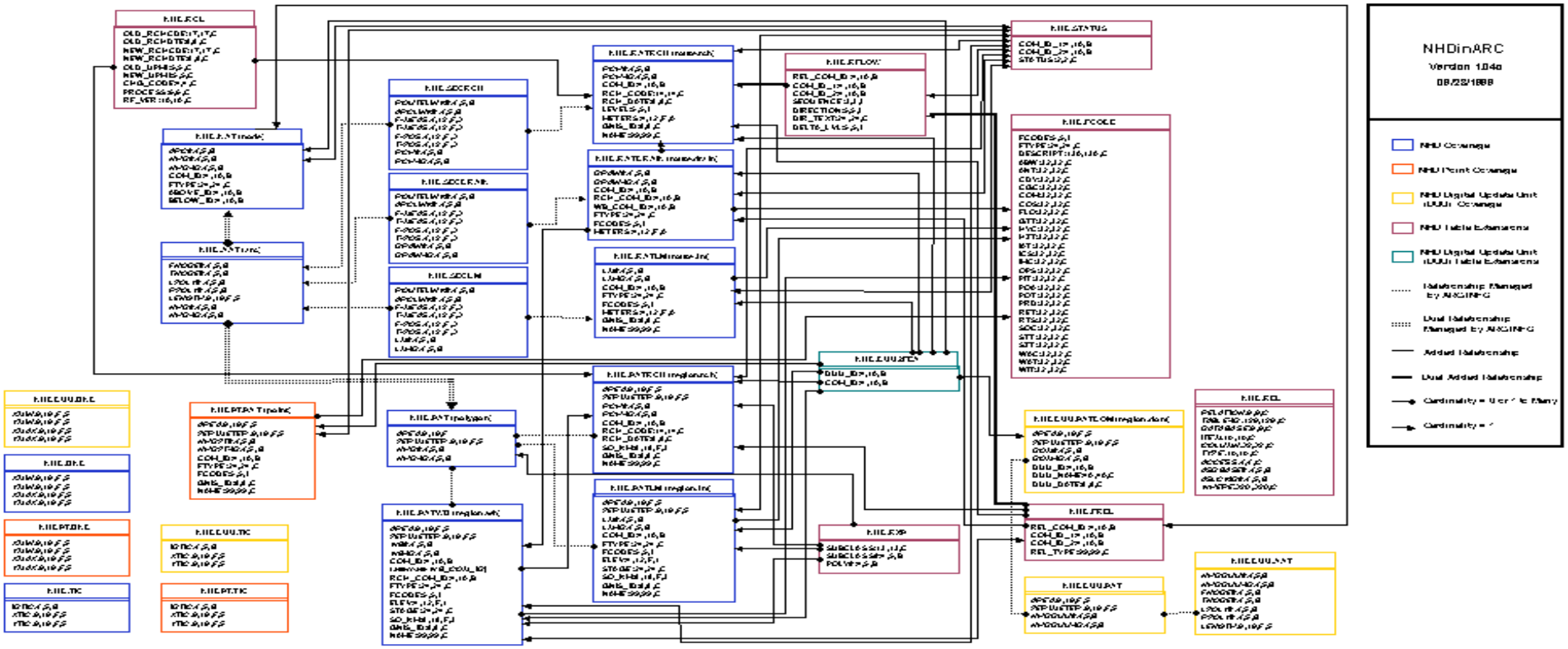
NHD – Applications, Related Programs, and Tools (4)

- **SPARROW - Spatially Referenced Regression of Contaminants on Watershed Attributes**
- **WQSDB - Water Quality Standards Database**
- **USGS Gaging Station info linked to NHD - Dave Stewart of USGS WRD**
- **NHD Flow Volume and Velocity Estimator**
- **NHD Stream Order Tool**

NHD – Applications, Related Programs, and Tools (5)

- NHD ArcView Tool Kit
- NHD Names Update Tool
- USGS National Rivers Information Center - prototype
- GRT non-point source projects
- NPL - water-related National Priority List locations
- Aquatic GAP

NHDinARC GeoRelational Model



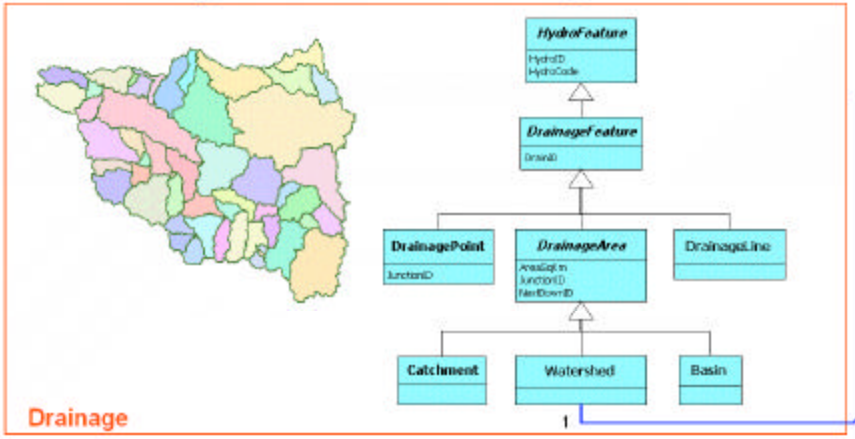
(Use of trade, product, or firm names is for descriptive purposes only and does not imply an endorsement by the U.S. Government.)

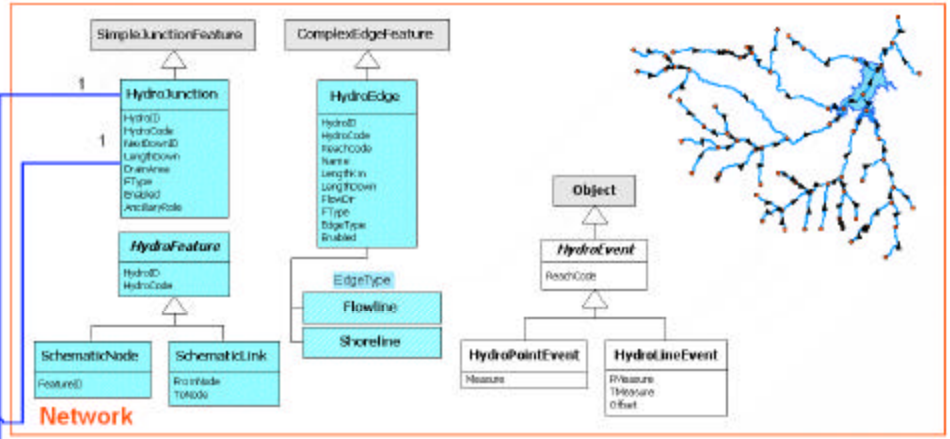
ArcGIS Hydro Data Model

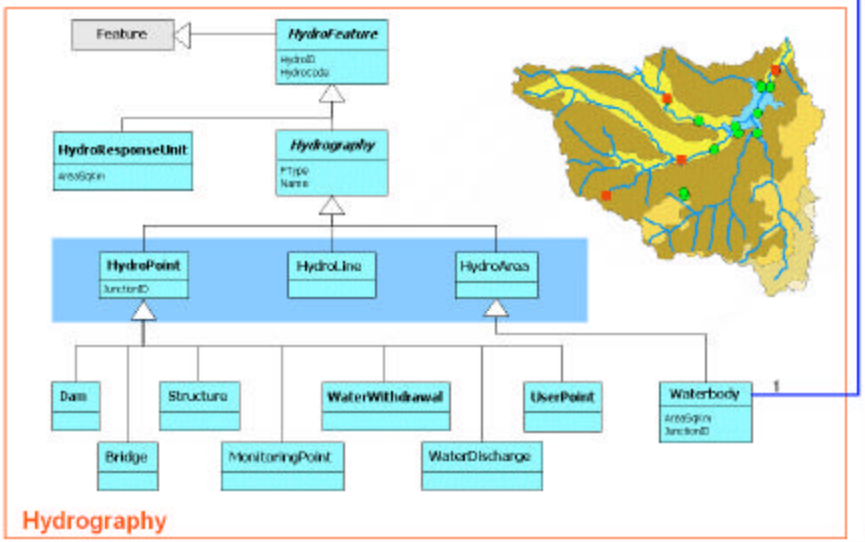
http://arconline.esri.com in the data models section

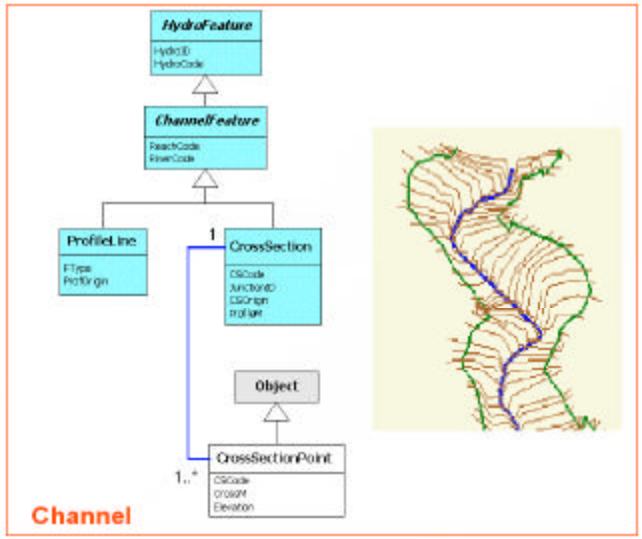
http://www.crwr.utexas.edu/giswr

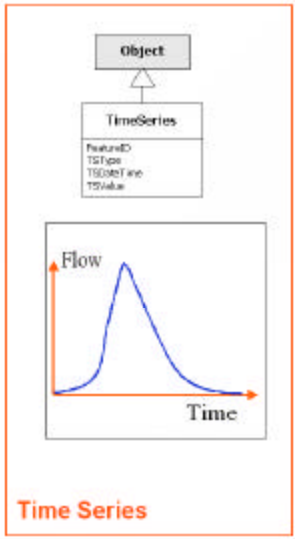
GIS in Water Resources Consortium

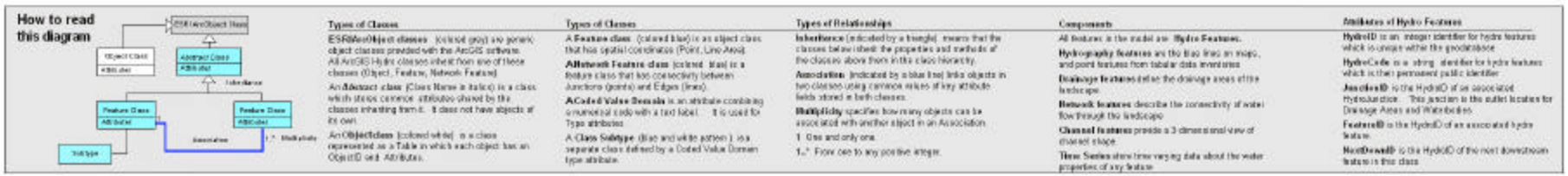










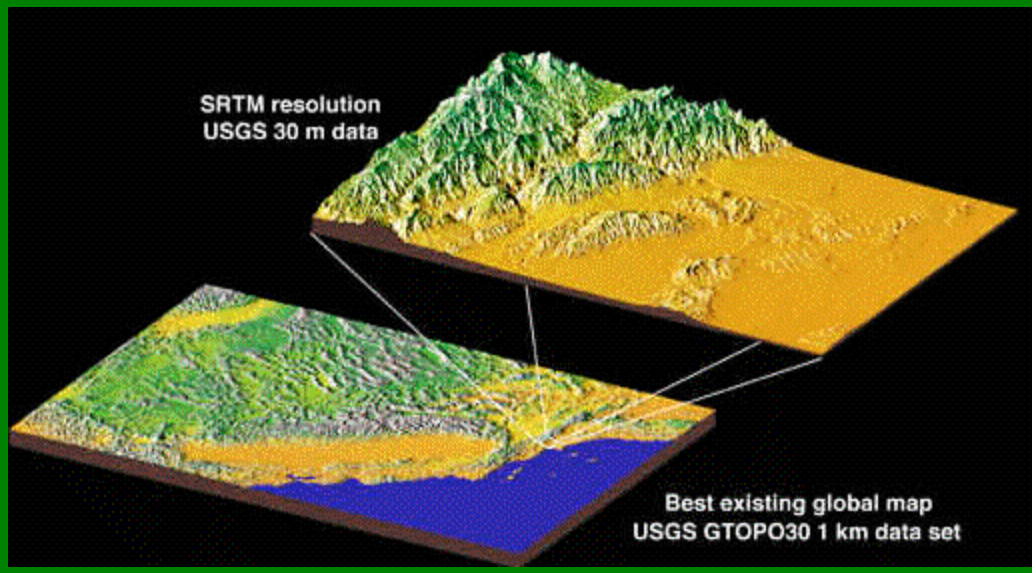


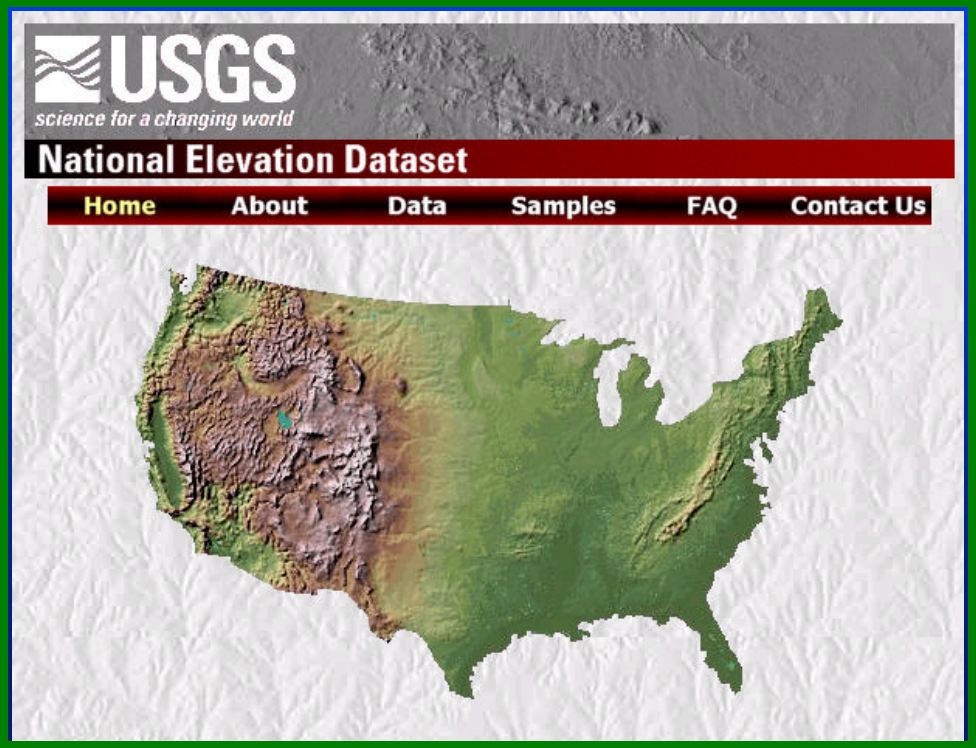
The National Map: Data Characteristics

- Seamless
- Consistently classified
- Variable resolution, completeness
- Consistency and integration among themes of data
- Current to within seven days
- Variable positional accuracy without cartographic offsets

National Elevation Dataset (NED)

- **Filtered**
- **Edge matched**
- **Common datum**
- **Common coordinate system**
- **One arc second (30 meter) spacing**
- **Future 10 meter, LIDAR, SRTM**

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science for a changing world
National Elevation Dataset
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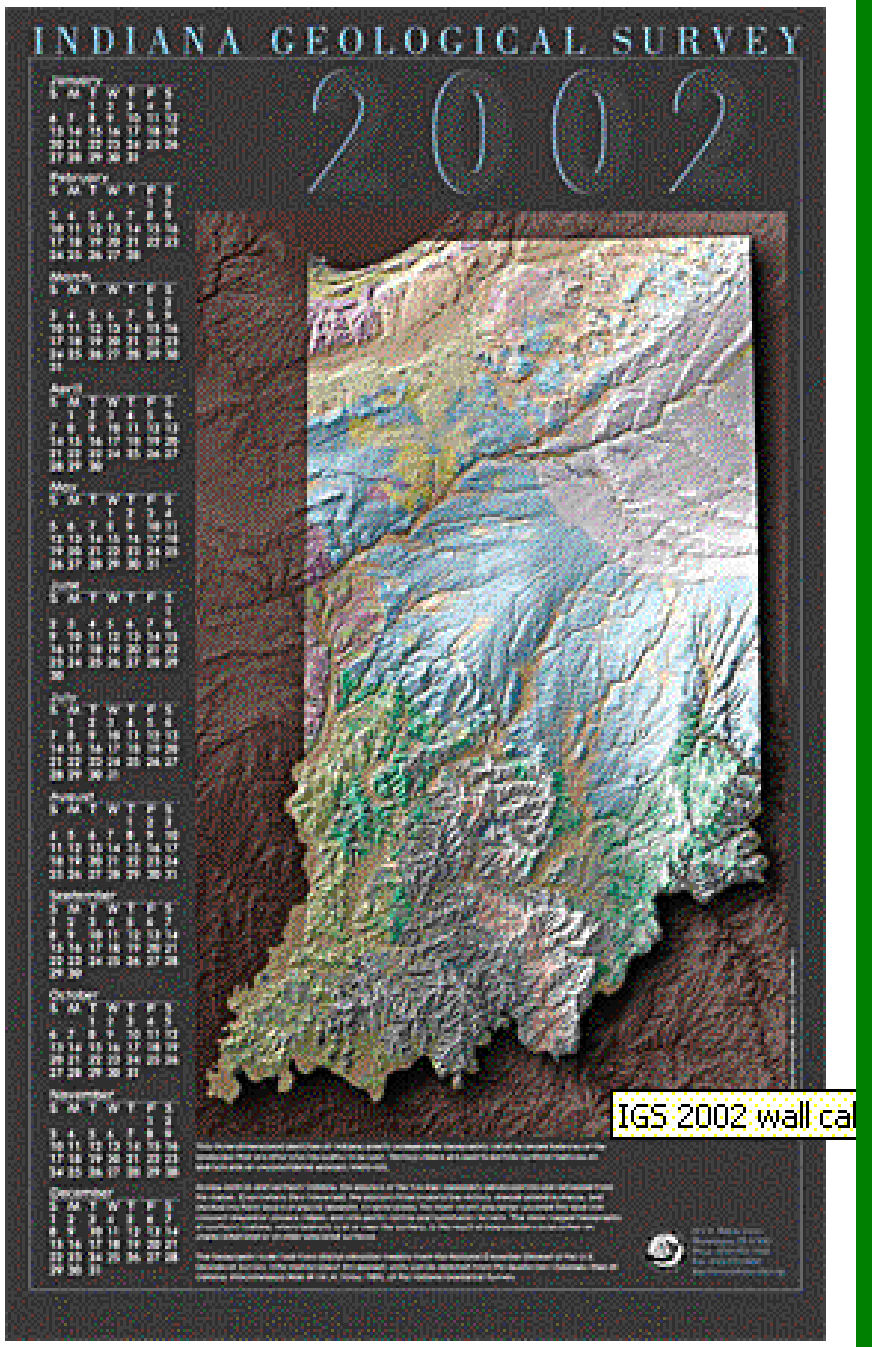
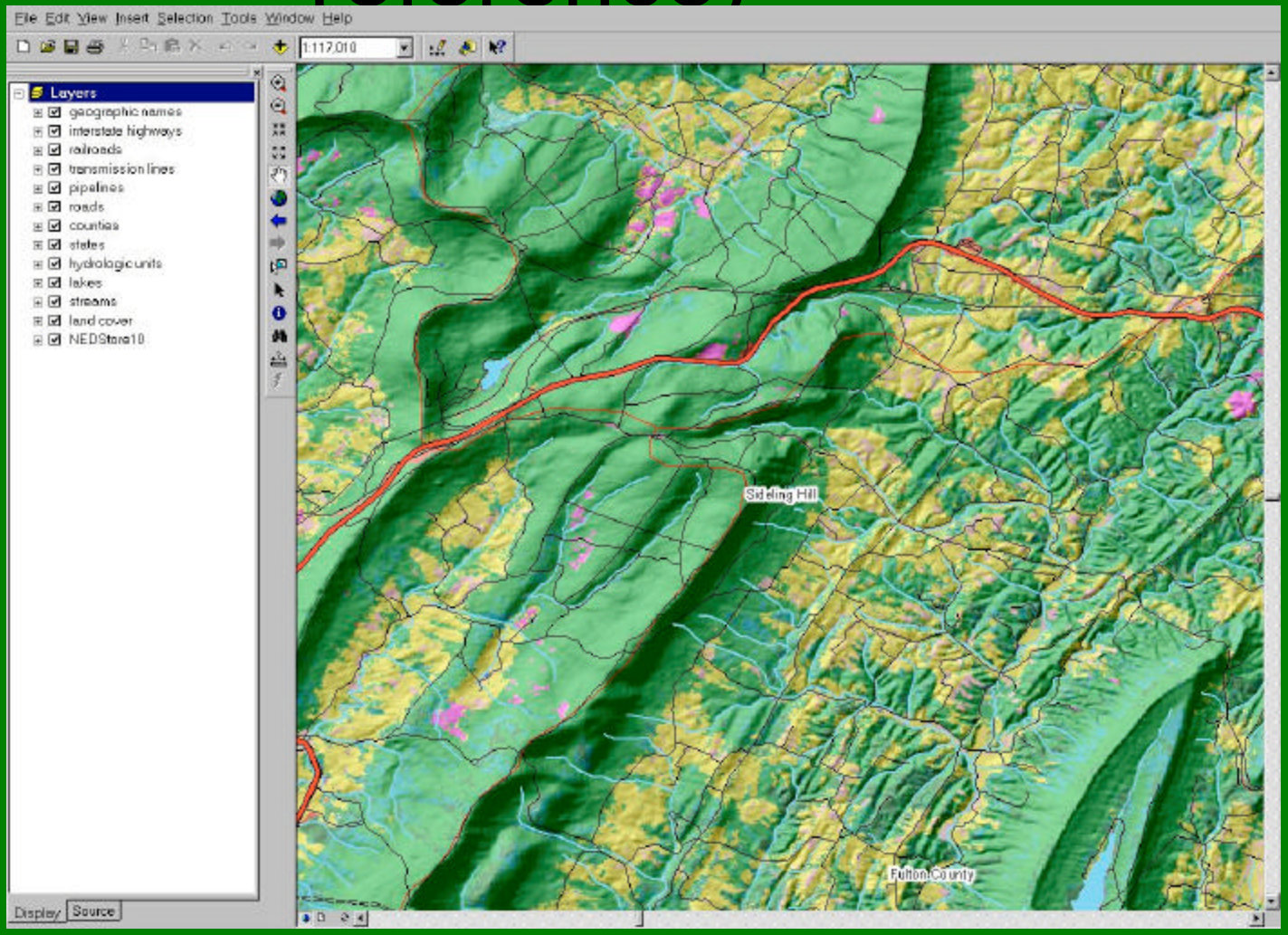
About
Data
Samples
FAQ
Contact Us


INDIANA GEOLOGICAL SURVEY
2002
IGS 2002 wall ca

National Land Cover Dataset (on NED shaded relief, plus reference)



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Watershed - Sub-basin

Obtaining Status, Data, and More Information

- National Hydrography Dataset site
  http://nhd.usgs.gov contains
  - Online access to download data
  - Technical references
  - Tutorials
  - Tools
- Data on media can be ordered at
  http://edc.usgs.gov/webglis
- Help at
  nhd@usgs.gov

National Hydrography Dataset Home Page - Netscape

File Edit View Go Communicator Help

USGS
science for a changing world

EPA
United States Environmental Protection Agency

text version

- NHD Home
- Technical References
- Data
- Tools
- Application Demo
- Tutorial Series
- Technical Support
- Maintenance

National Hydrography Dataset

The National Hydrography Dataset (NHD) is a comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. Within the NHD, surface water features are combined to form "reaches," which provide the framework for linking water-related data to the NHD surface water drainage network. These linkages enable the analysis and display of these water-related data in upstream and downstream order.

The NHD is based upon the content of USGS Digital Line Graph (DLG) hydrography data integrated with reach-related information from the EPA Reach File Version 3 (RF3). The NHD supersedes DLG and RF3 by incorporating them, not by replacing them. Users of DLG or RF3 will find the National Hydrography Dataset both familiar and greatly expanded and refined.

While initially based on 1:100,000-scale data, the NHD is designed to incorporate and encourage the development of higher resolution data required by many users.

NHD News

The NHD data server is experiencing problems and is currently unavailable (4/16/01)

Slides and Videos from the NHD Applications Symposium (2/28/01)

NHD News Archive

Search USGS | USGS | EPA | FGDC

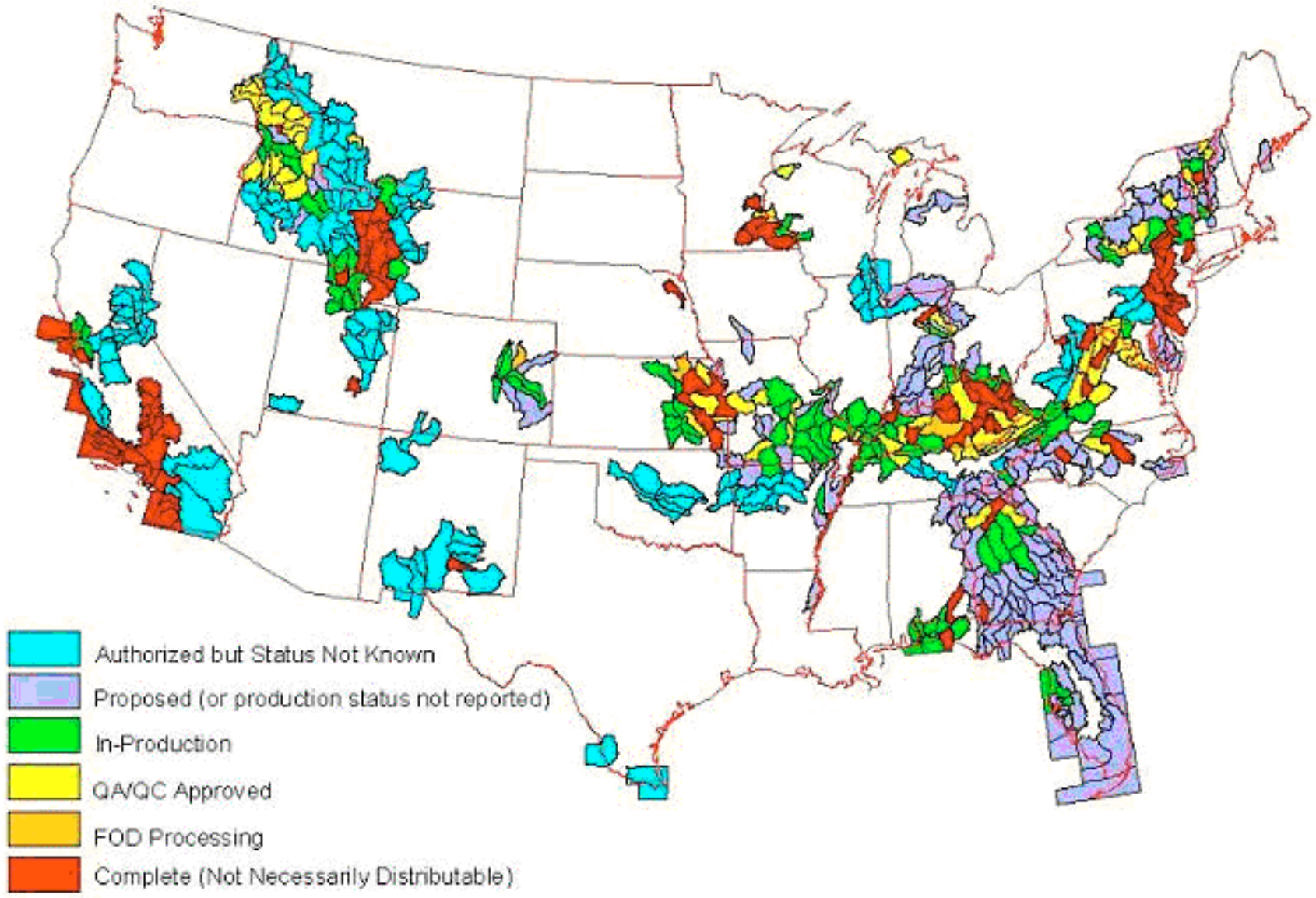
U.S. Department of the Interior
U.S. Geological Survey

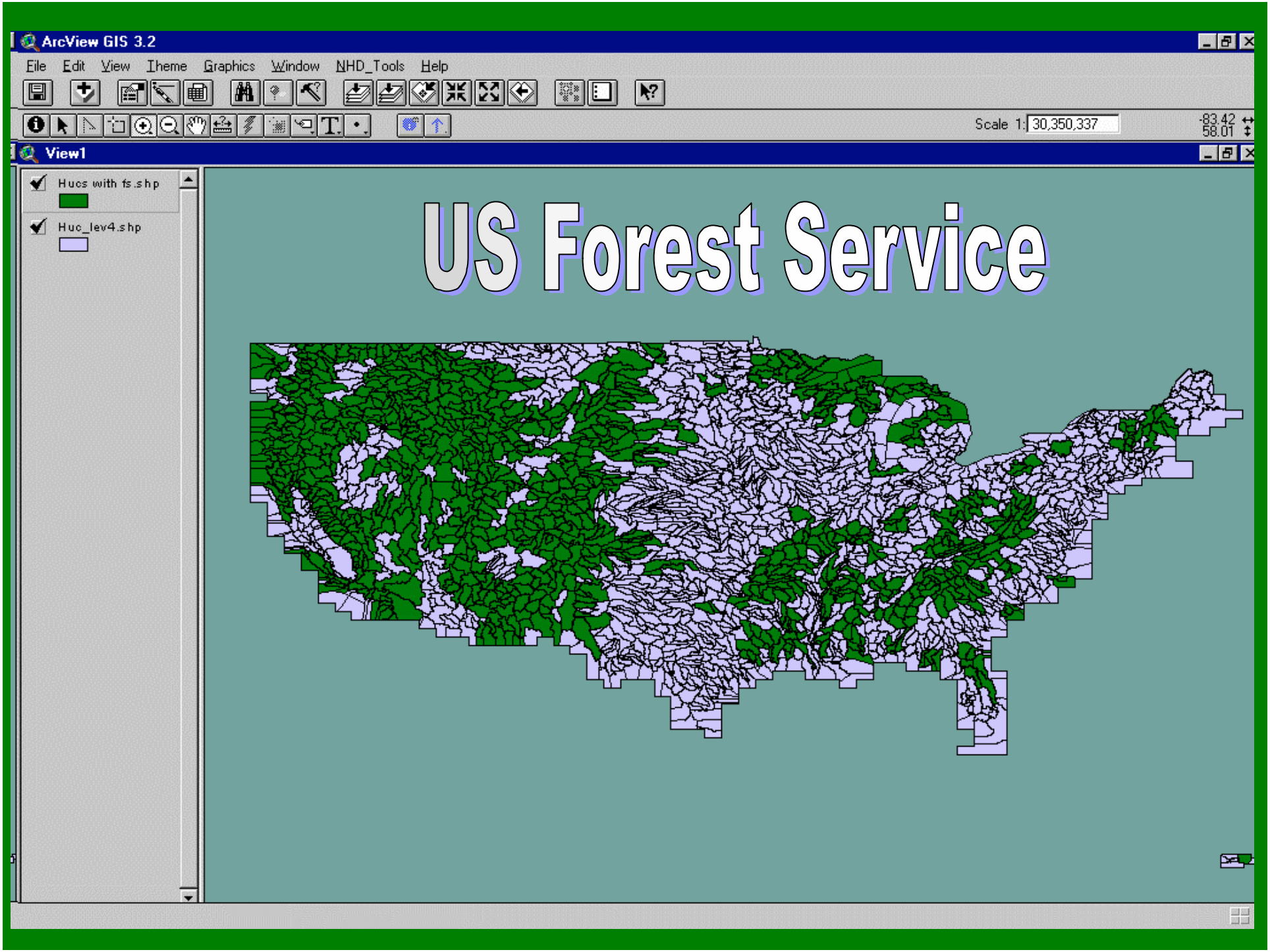
Document: Done

Getting Copies of the Data

- "NHDinArc" – tarred and compressed ArcInfo workspaces
- Workspace contains
  - Data for one hydrologic cataloging unit (sub-basin)
  - Three ArcInfo coverages plus several related INFO tables
  - Folder containing the text metadata files

High Resolution NHD Status 3/29/02




ArcView GIS 3.2
File Edit View Theme Graphics Window NHD_Tools Help
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View1
Hucs with fs.shp
Huc_lev4.shp
US Forest Service

National Hydrography Dataset

- **National program**
- **Combine hydro spatial data programs of**
  - **USGS DLG**
  - **EPA RF3**
  - **USFS CFF**
  - **other national, state, and regional partners**
- **Coordinate update efforts**

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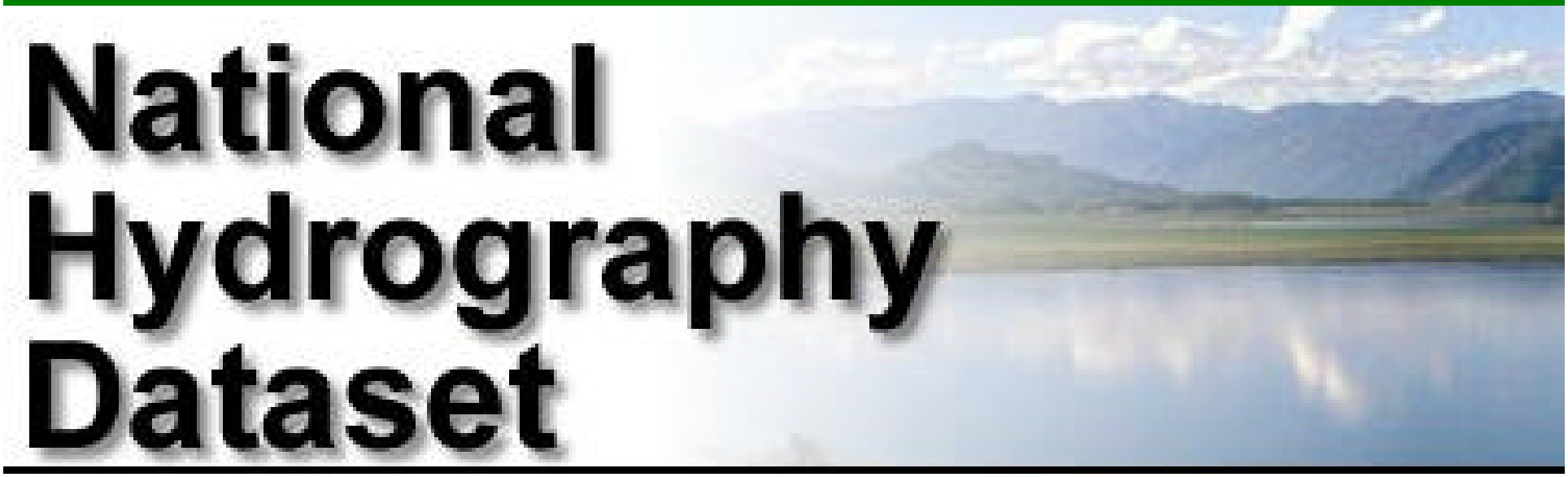
NHD Stewards

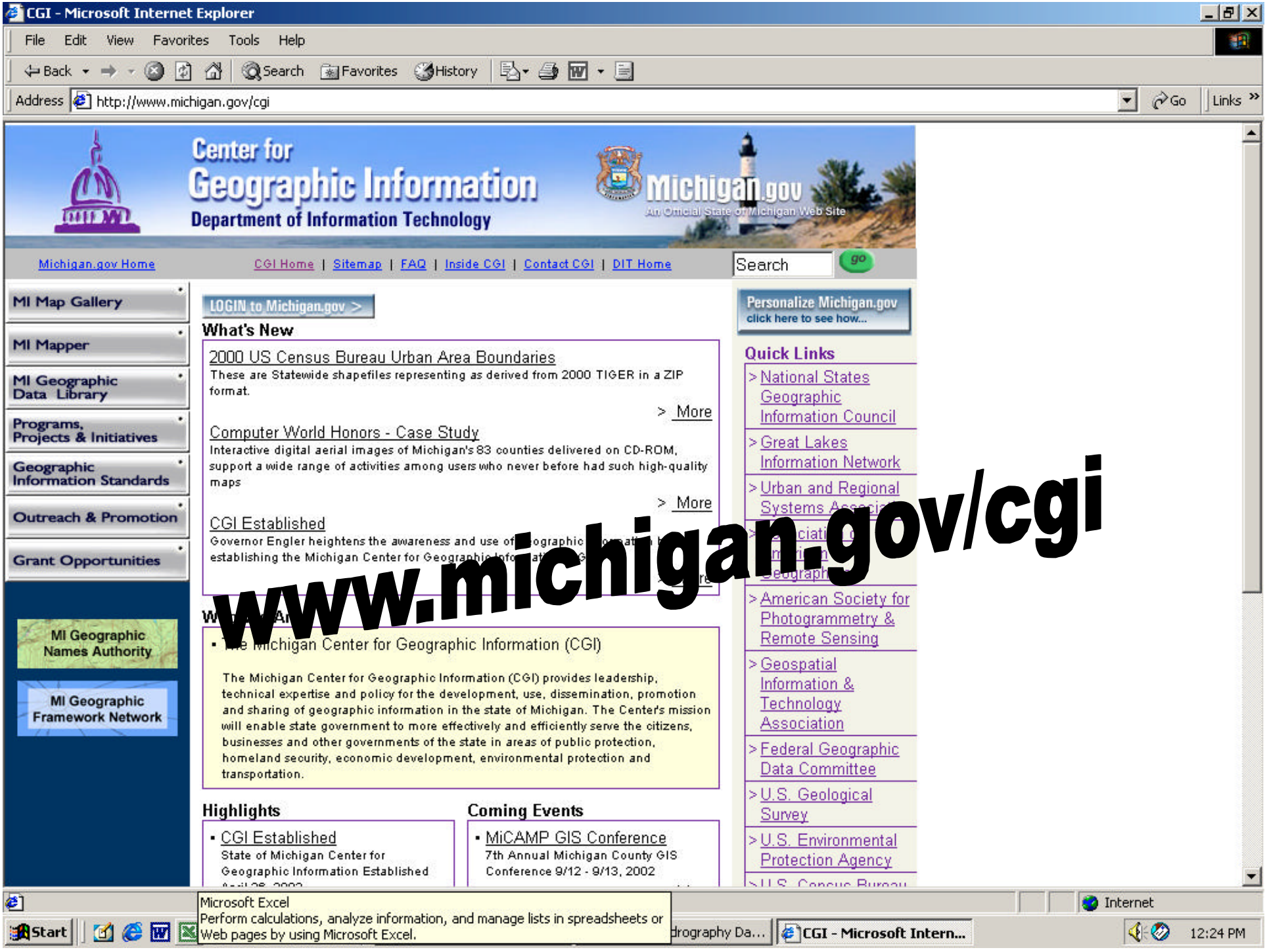
- **The NHD is a living dataset**
- **Revision updates needed**
- **Quality updates needed**
- **Organizations closest to the hydrography are most aware of ground truth**
- **Such organizations should have the opportunity to serve as stewards**
- **The USGS will assist**



Michigan NHD Stakeholders Meeting

April 15-16, 2002

Lansing, Michigan



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